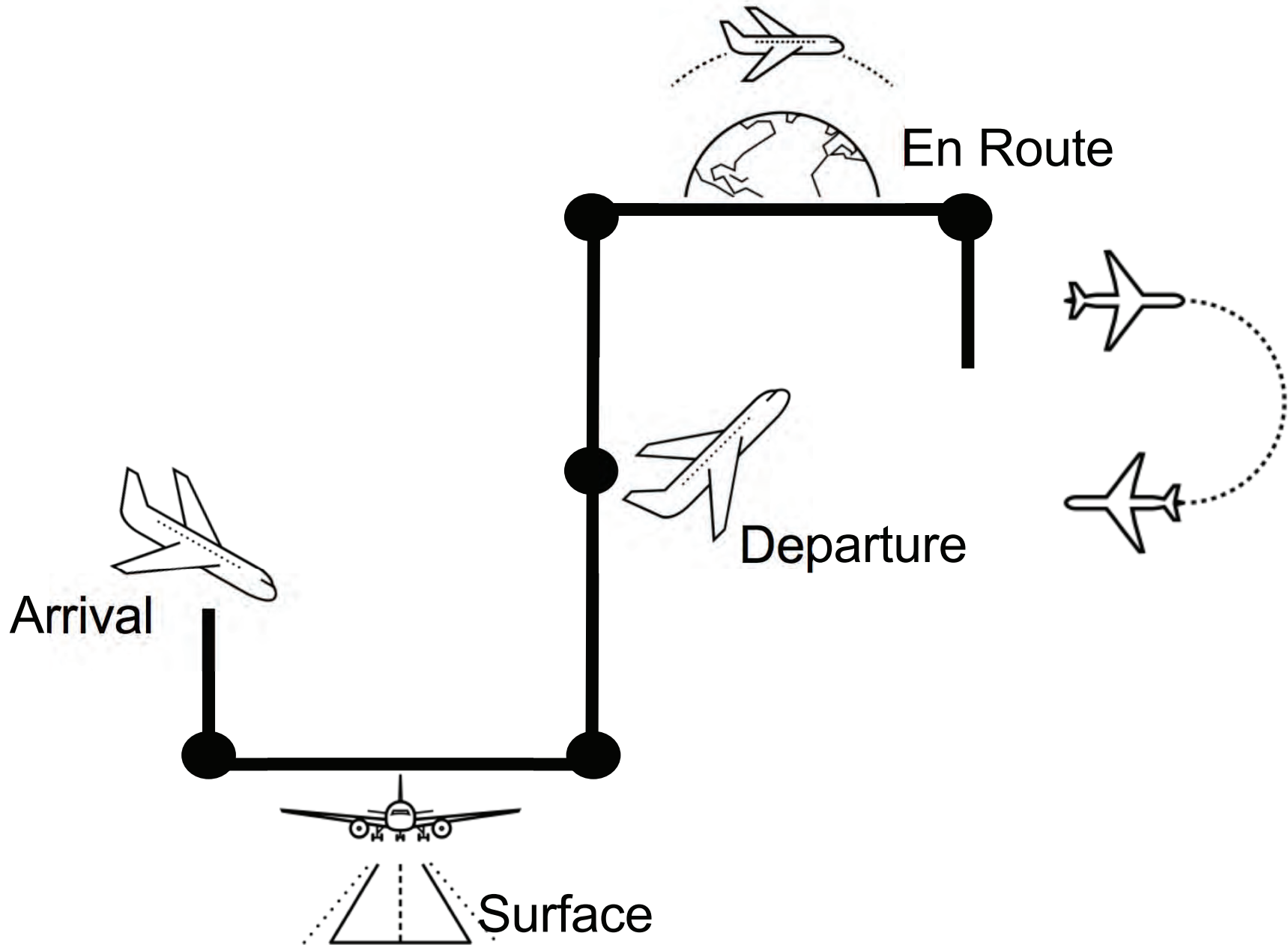


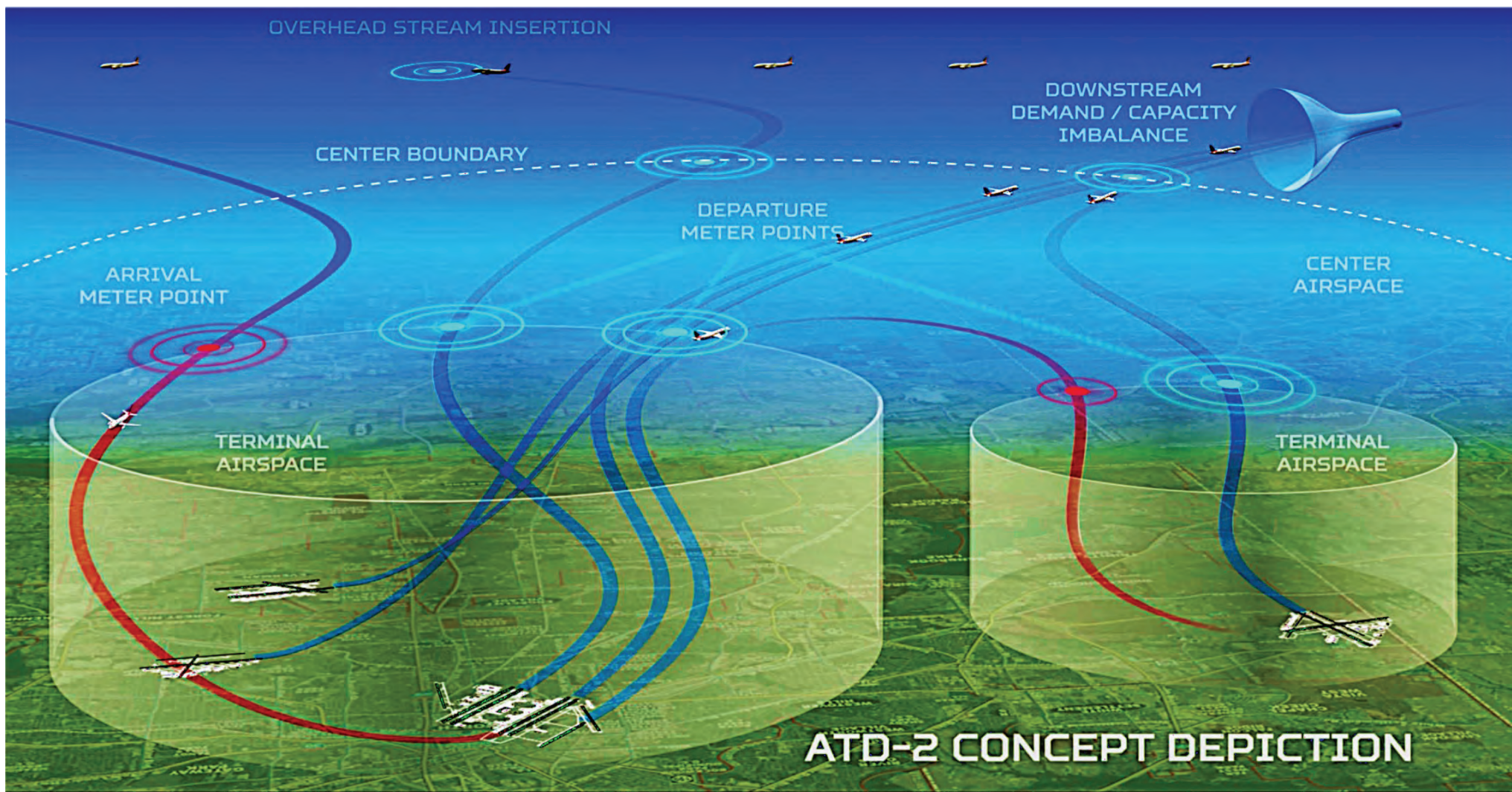


Operational Impact of the Baseline Integrated Arrival, Departure, and Surface System Field Demonstration

Shivanjli Sharma, Al Capps, Shawn Engelland, and
Yoon Jung
NASA

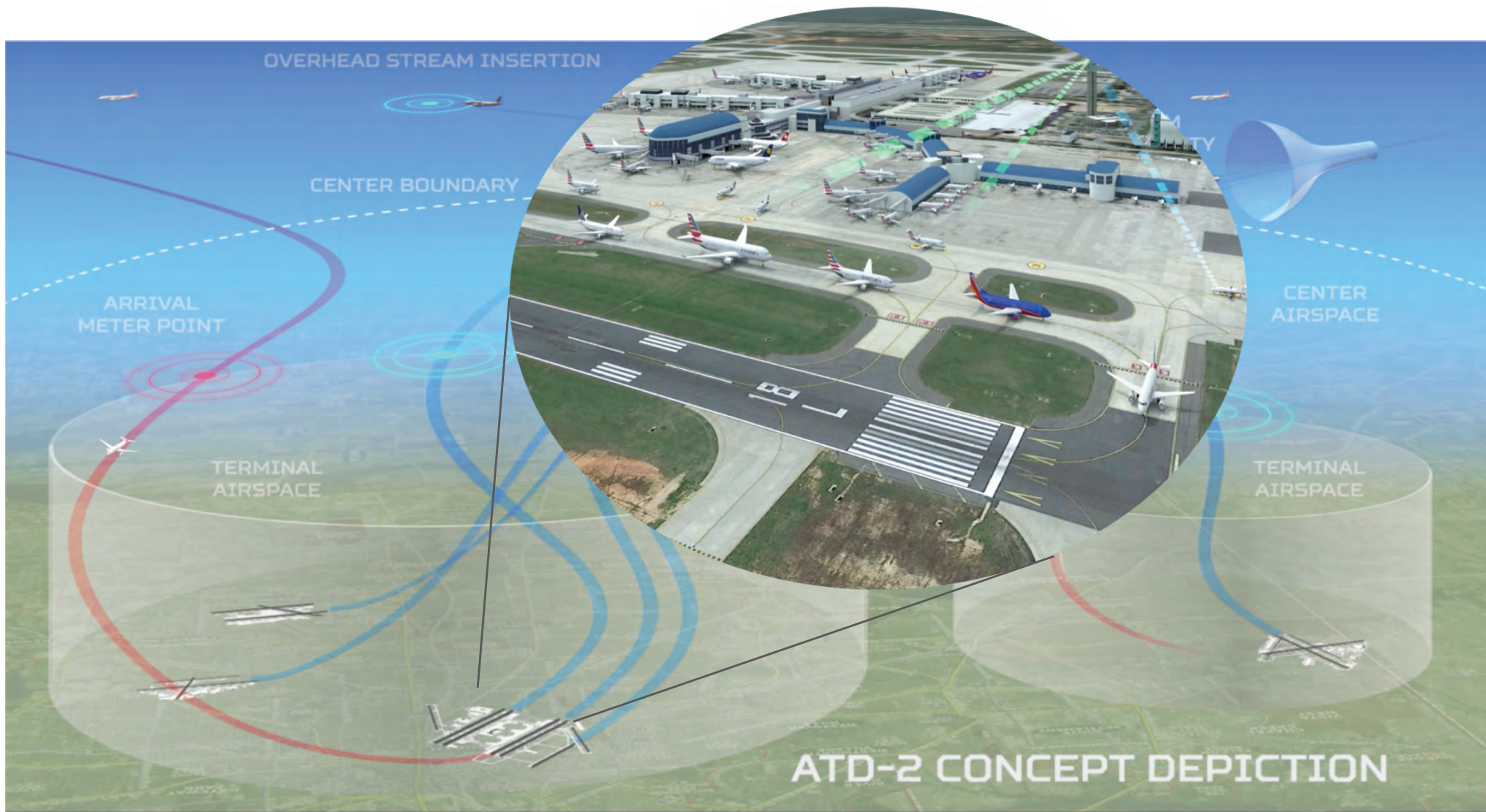
DASC 2018, Sep 25-27, 2018

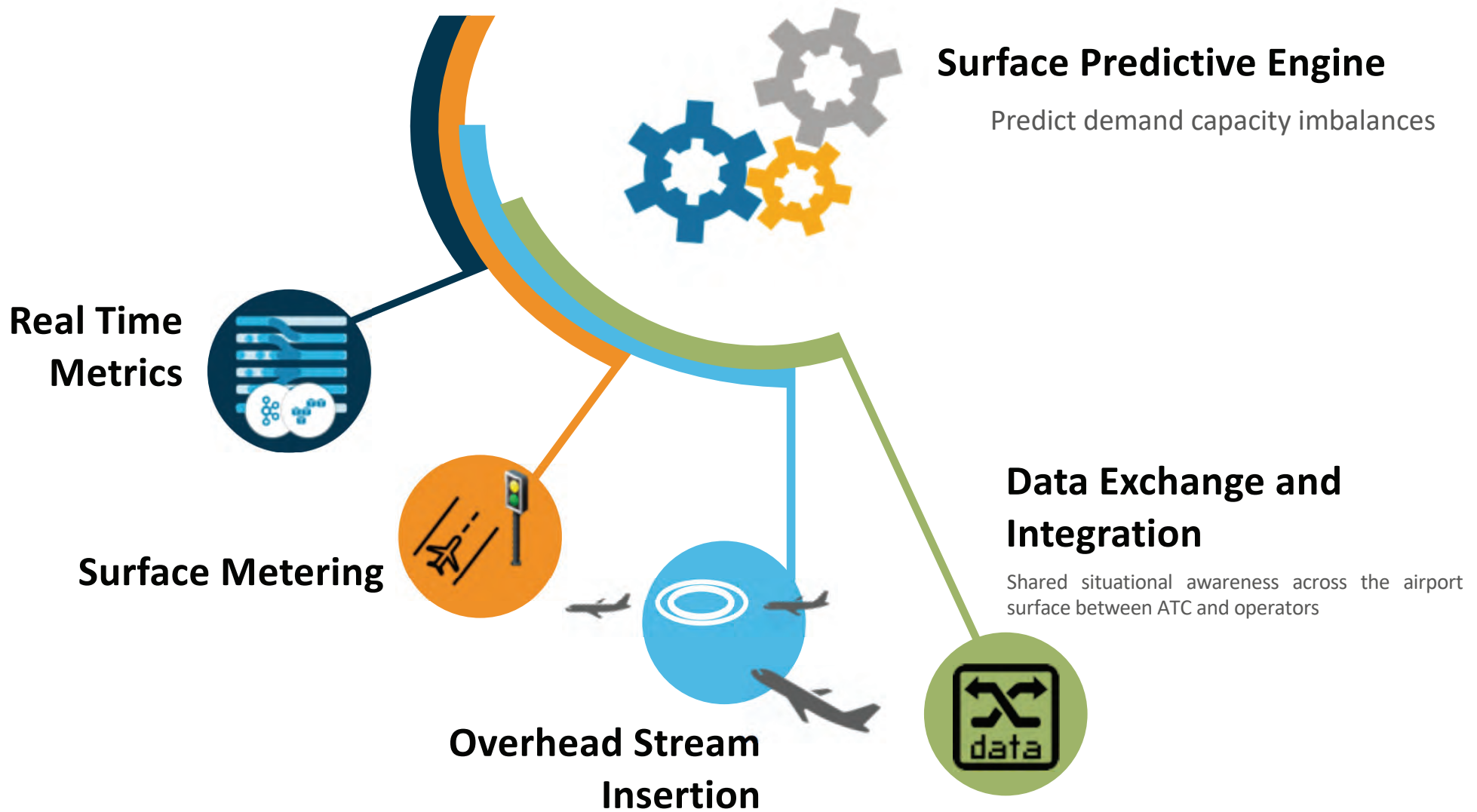


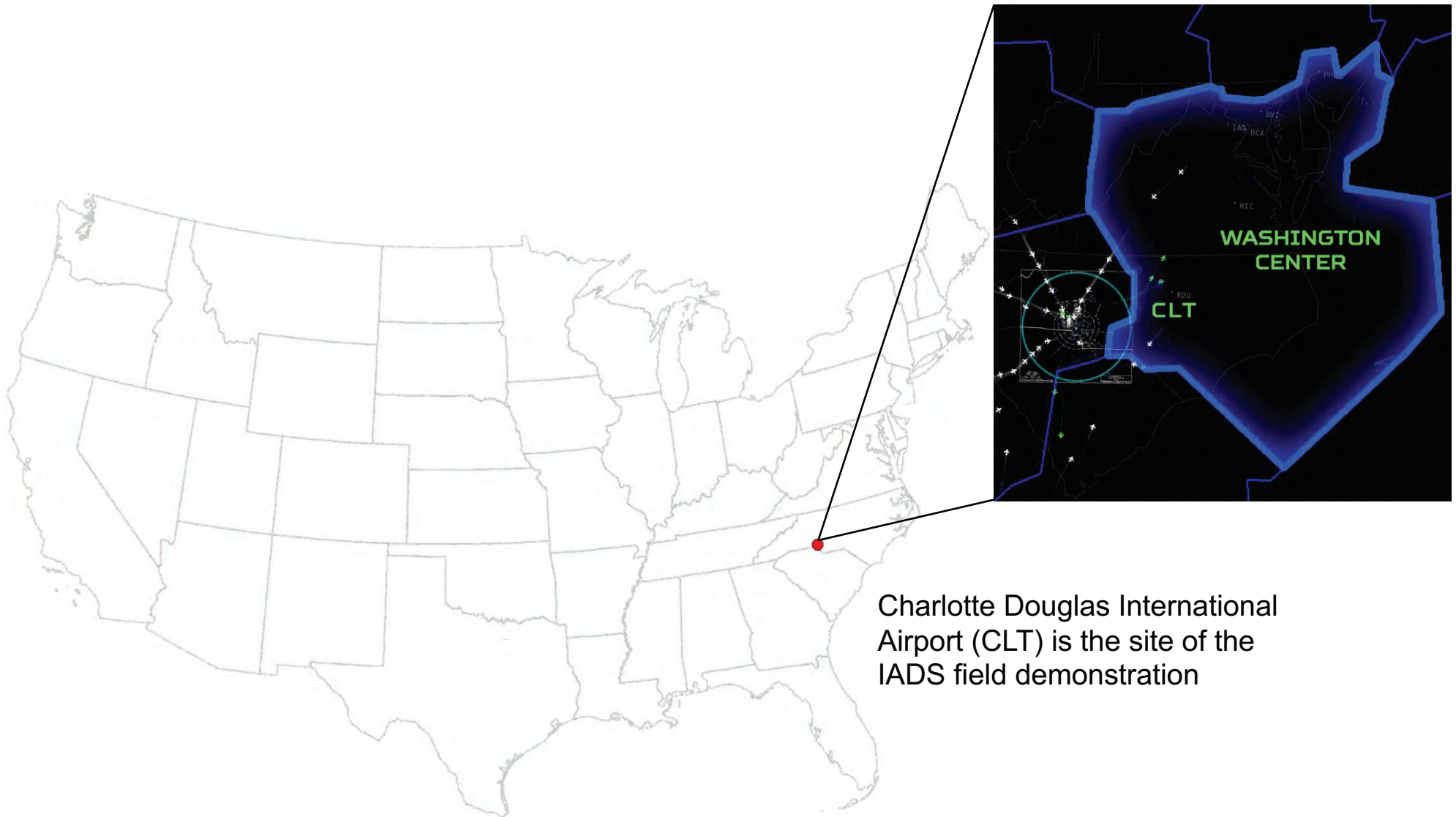


Airspace Technology Demonstration 2 (ATD-2)

Integrated Arrival, Departure, and Surface (IADS) Operations

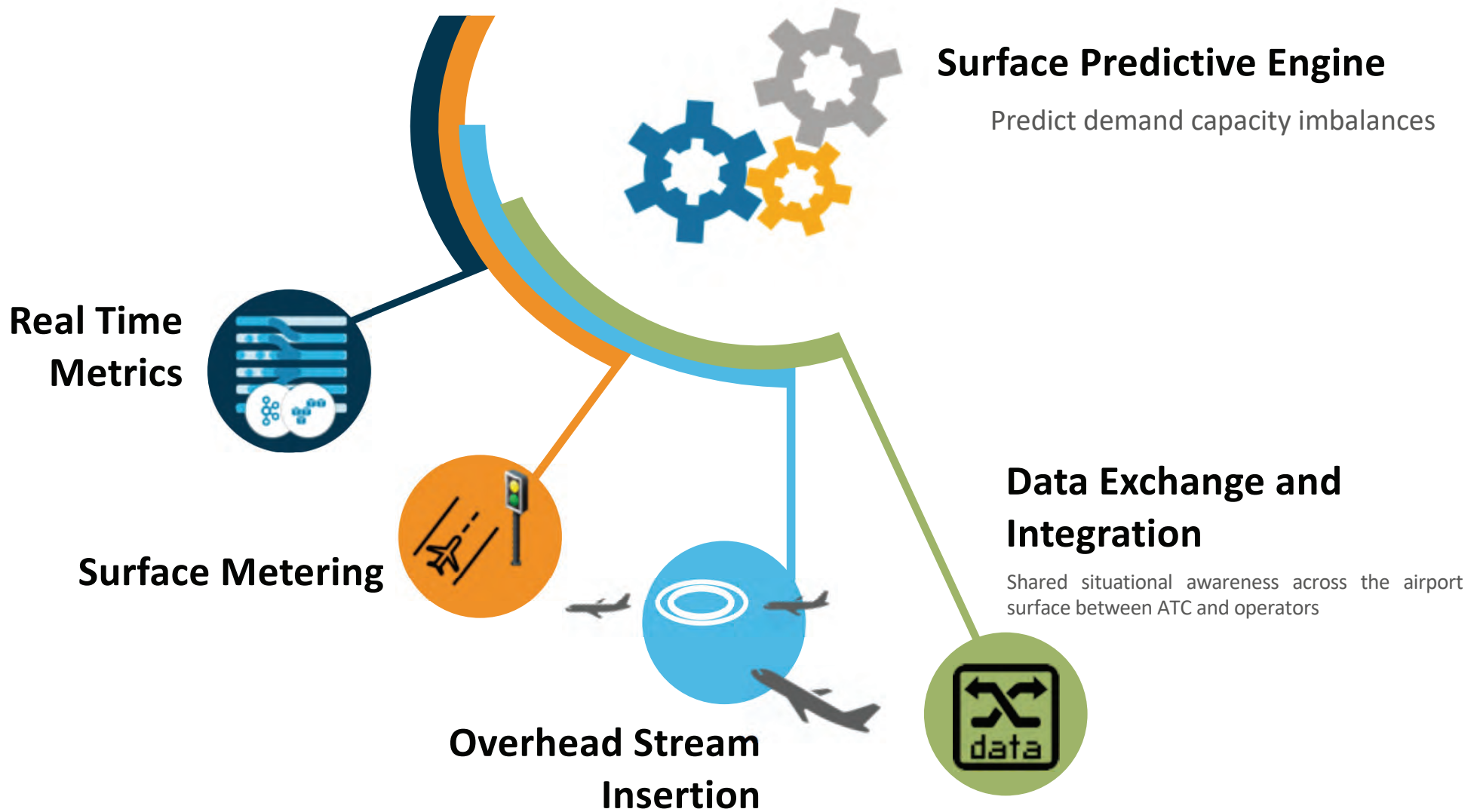


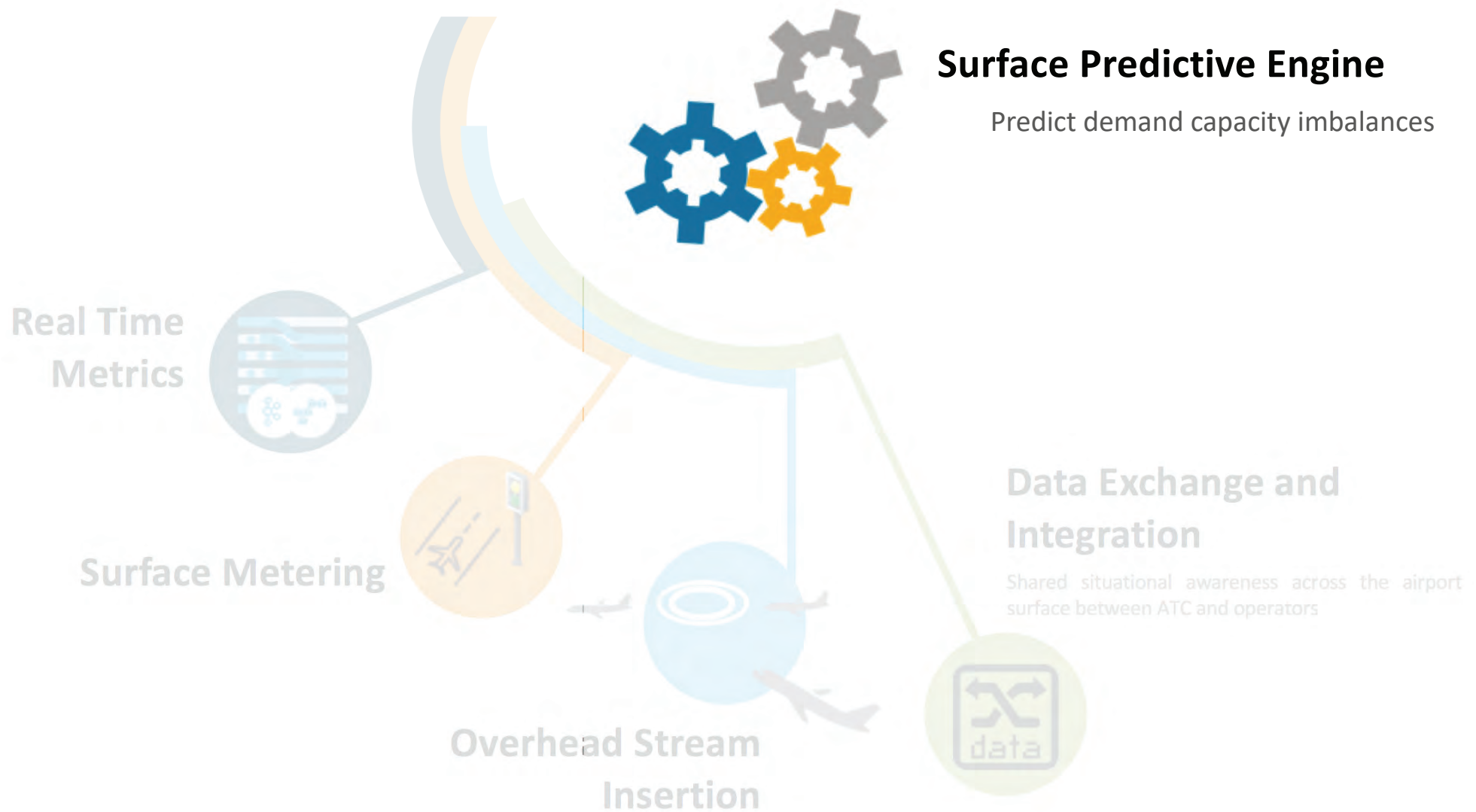


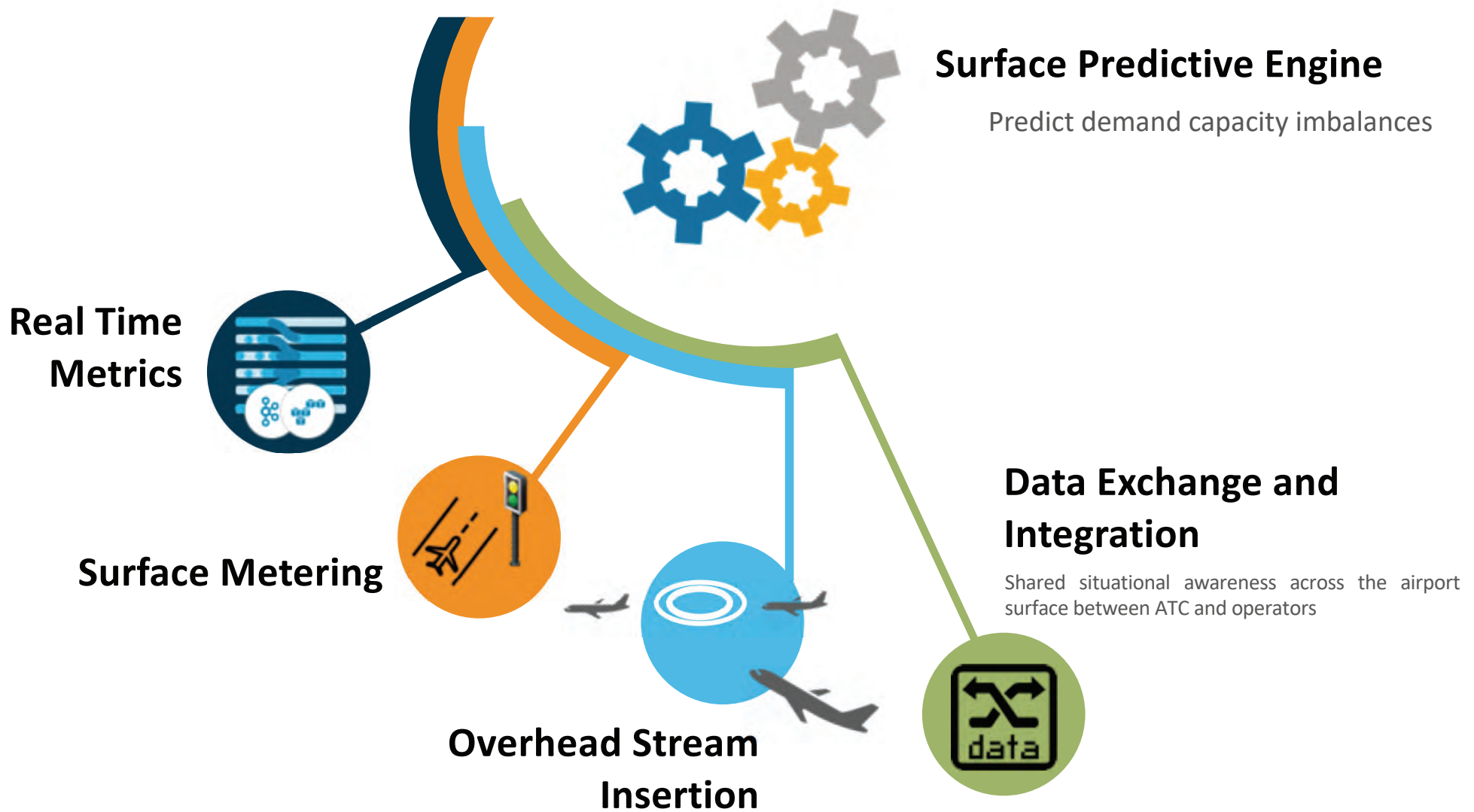


Charlotte Douglas International Airport (CLT) is the site of the IADS field demonstration

CLT is the seventh busiest airport in the world by total aircraft movements (553,812 takeoffs and landings in 2017)





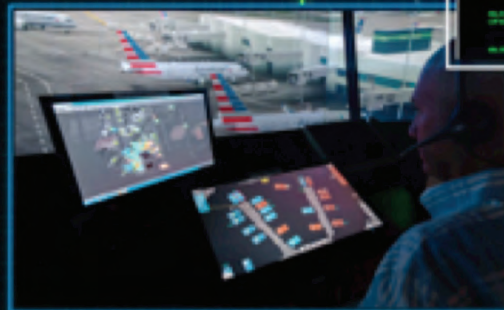




TOWER



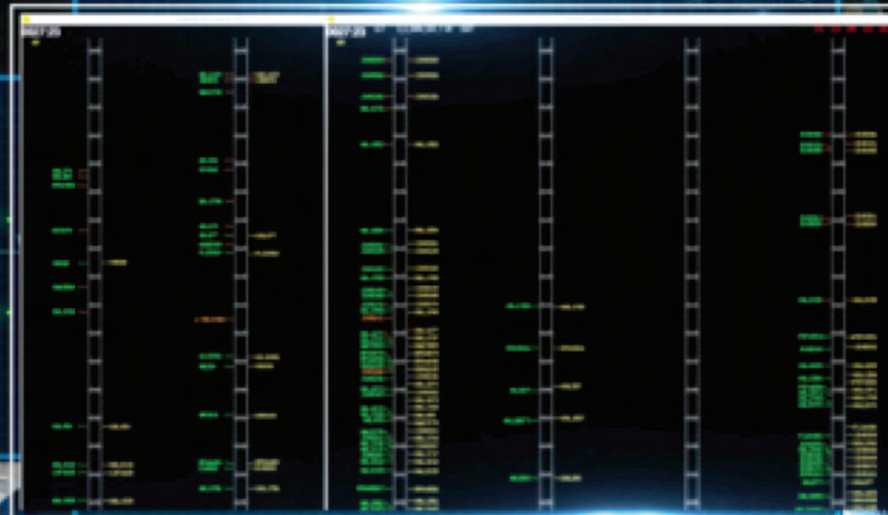
TERMINAL



RAMP



CENTER



ATD-2 SCHEDULERS

ATC to Operator

- Real-time traffic management initiatives
- Airport configuration coordination
- Runway intent information

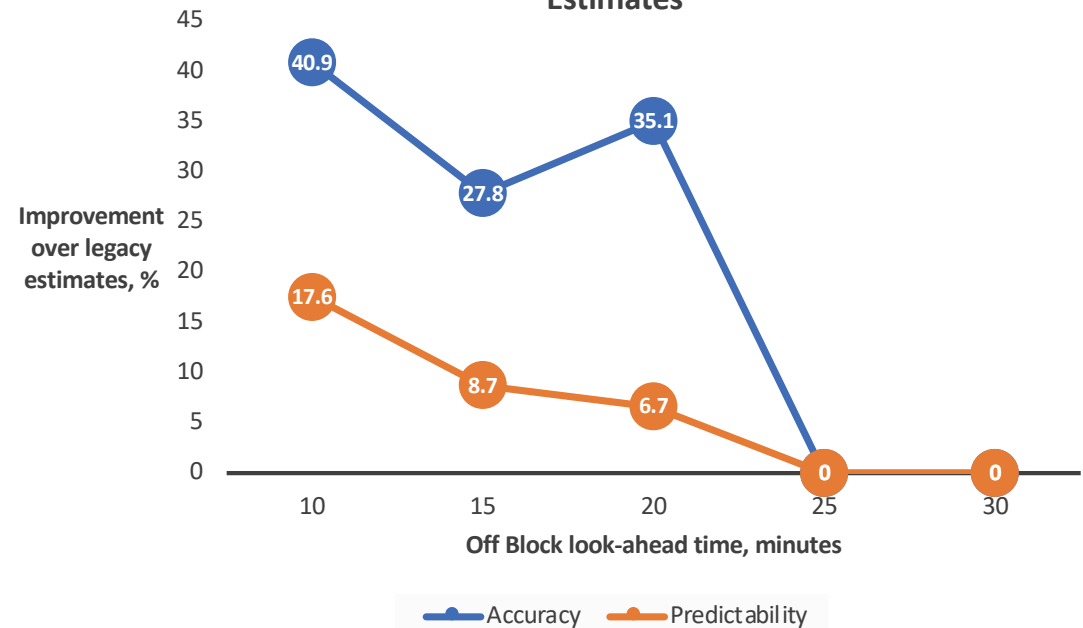
Call for release or
Controlled Take off Time

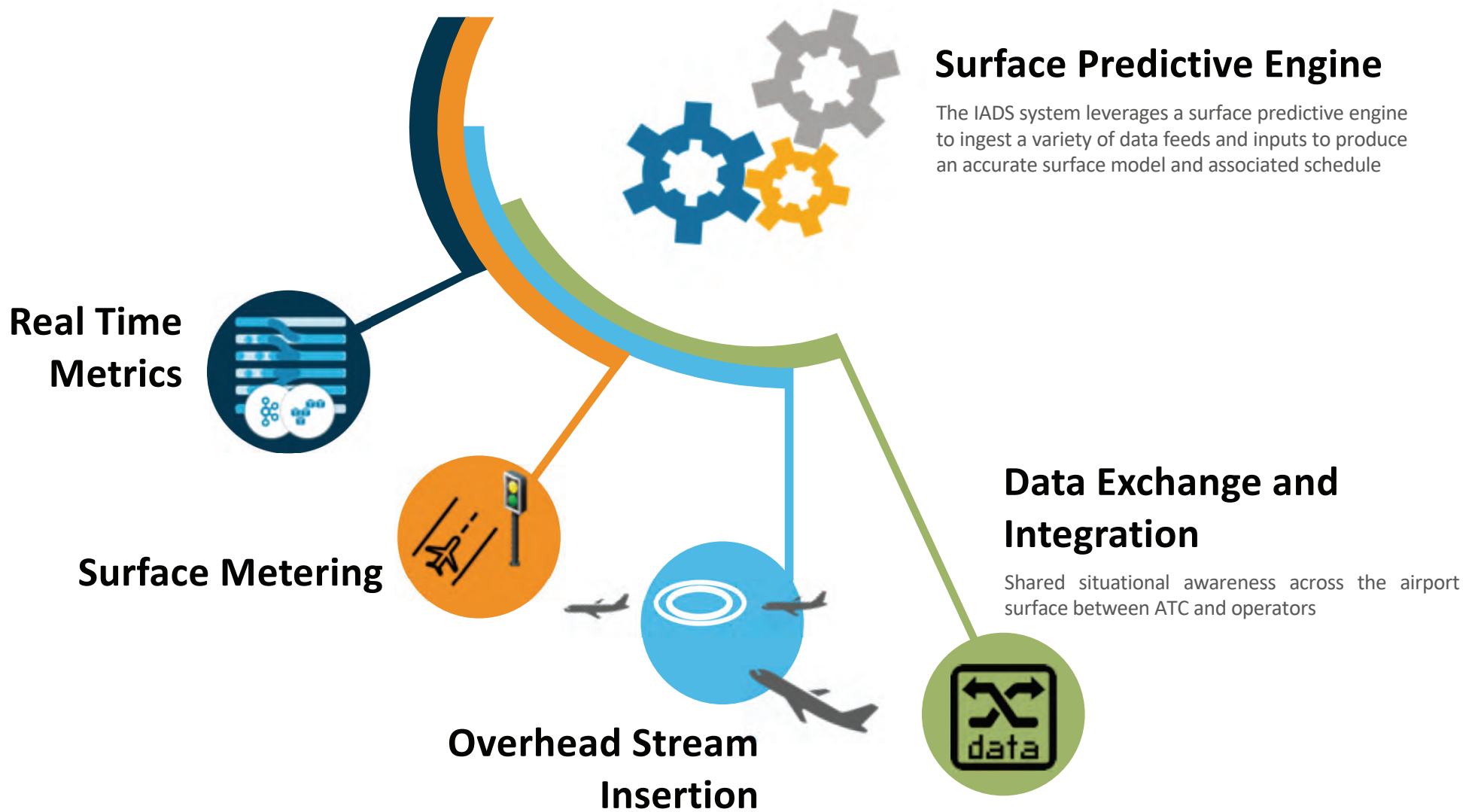
UAL1087	A319	E
KILNS-EWR		
A2100		
A10 27	18L	1916

Operator to ATC

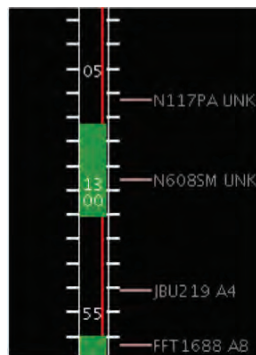
- Earliest Off Block Times (EOBT) or ready times enable better planning
- Ramp status coordination
- Gate conflict information

EOBT/Ready Time Improvement Over Legacy Off Block Estimates

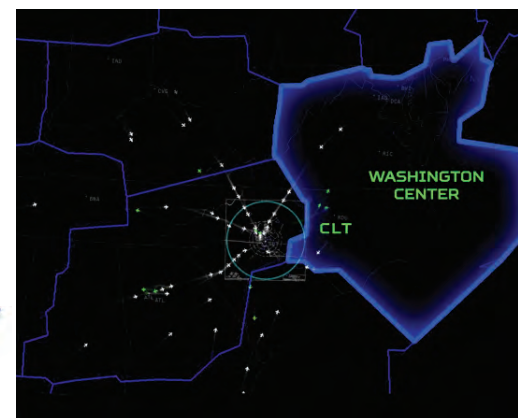




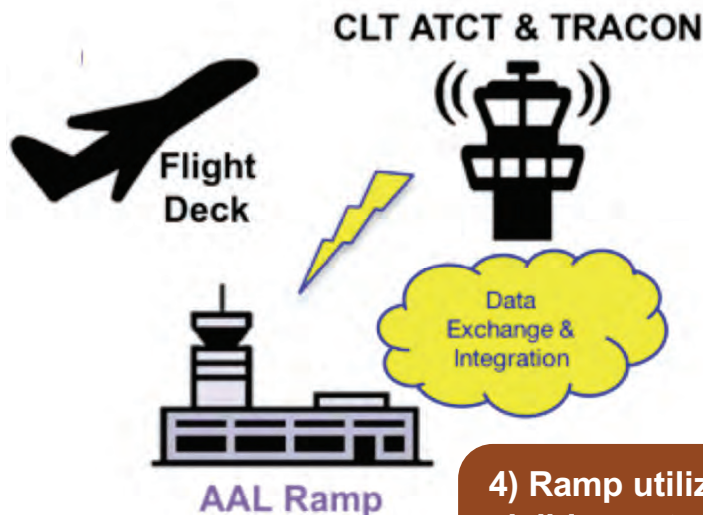
Collaborative Nature of Overhead Stream Insertion



2) Electronically negotiate for a time based on red/green space



1) Pilot calls into clearance delivery approximately 10 min prior to push back for controlled times



3) Center approves or adjusts the time based on center constraints

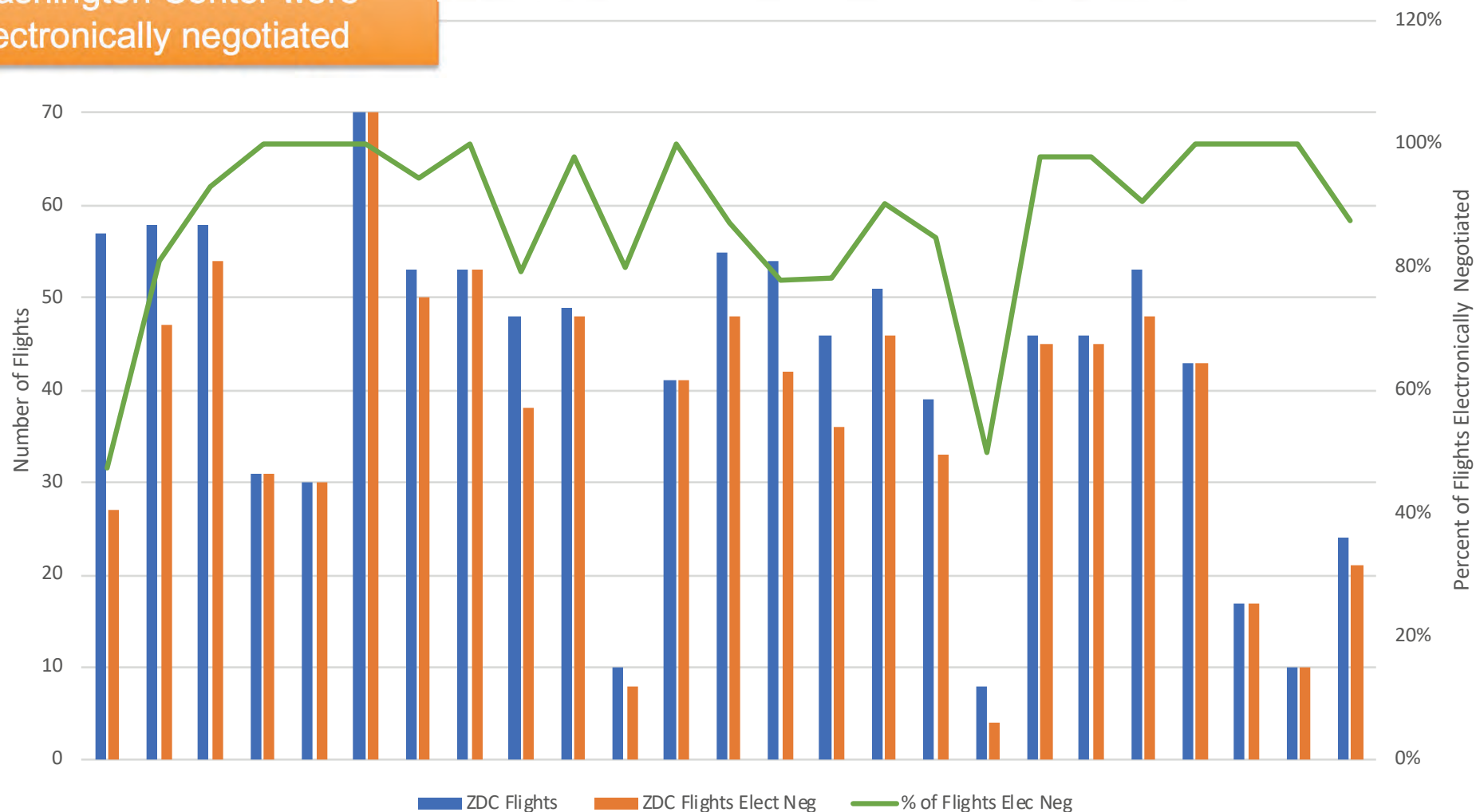
4) Ramp utilizes the now visible controlled time on their strips and pushback advisories

Overhead Stream Electronic Negotiation Operational Use

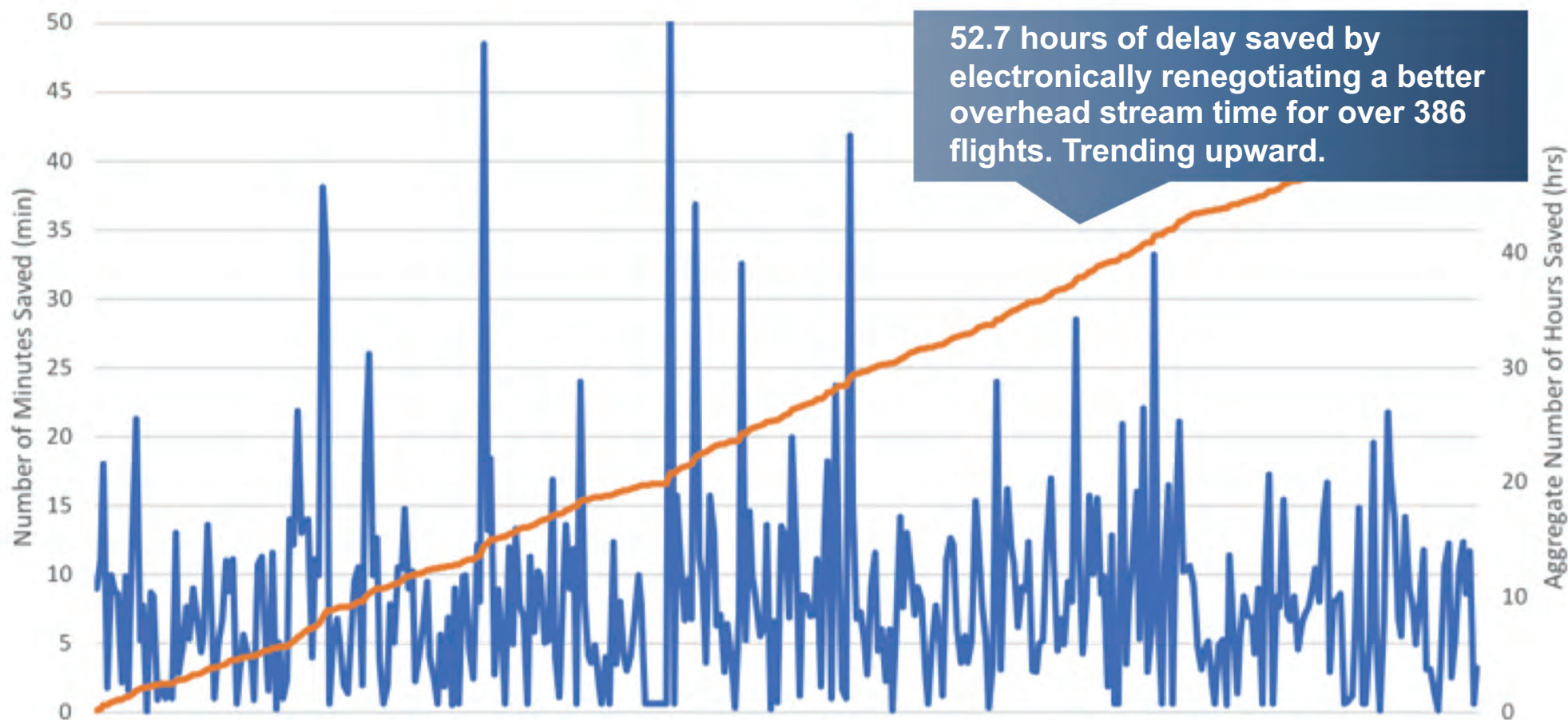


85% of flights to
Washington Center were
electronically negotiated

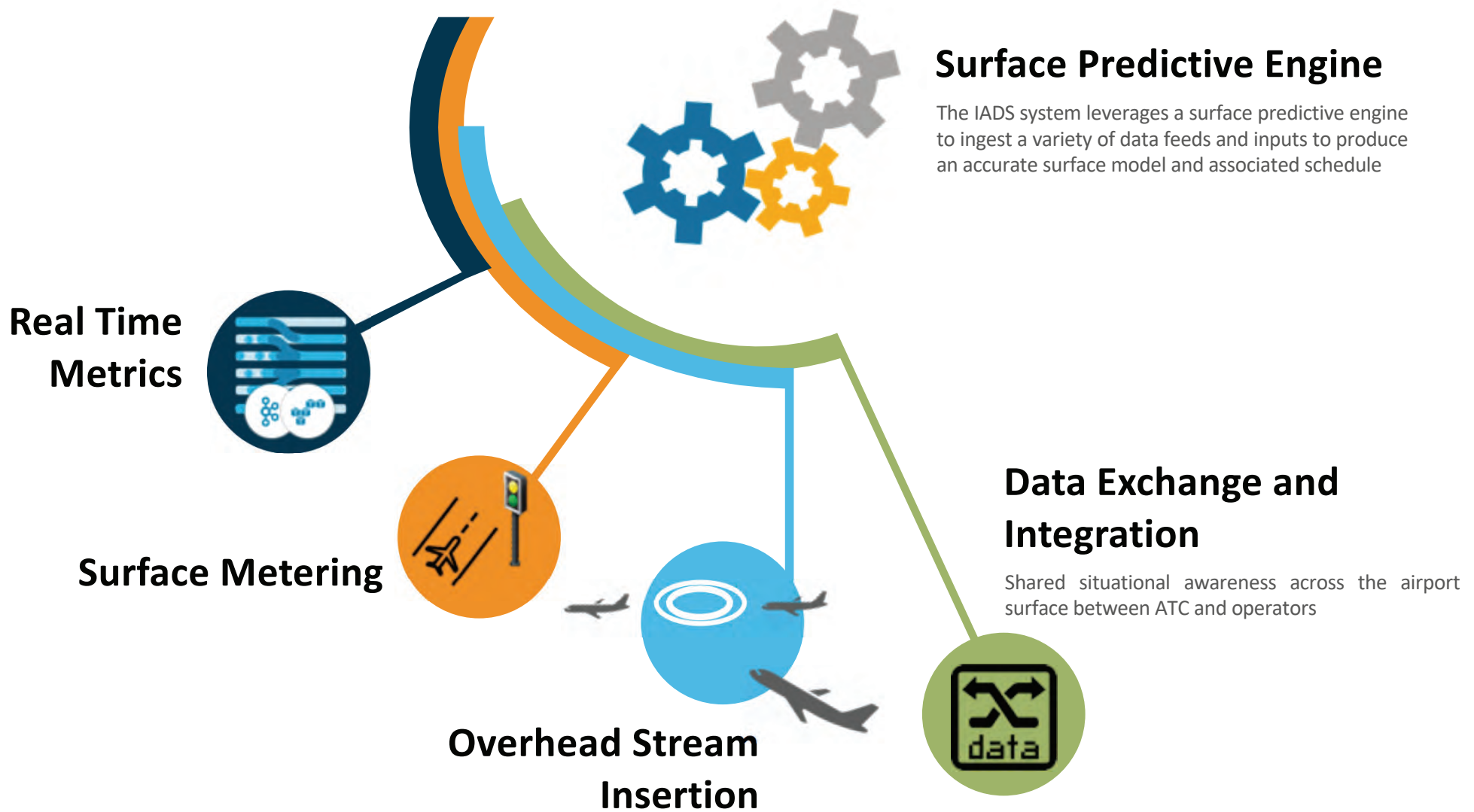
Flights Through Washington Center Electronically Negotiated



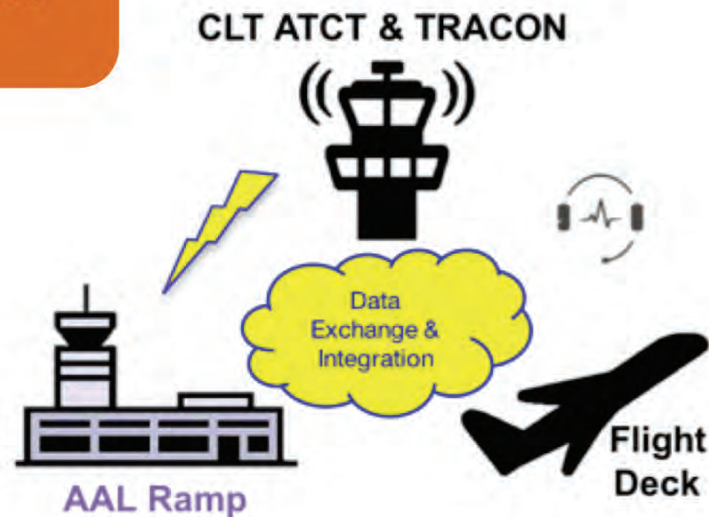
Overhead Stream Renegotiation Time Savings



The benefits described here are associated with better use of existing capacity in the overhead stream, and technology to reduce surface delay.



1) ATC and Ramp operators utilize IADS displays to view demand capacity imbalances

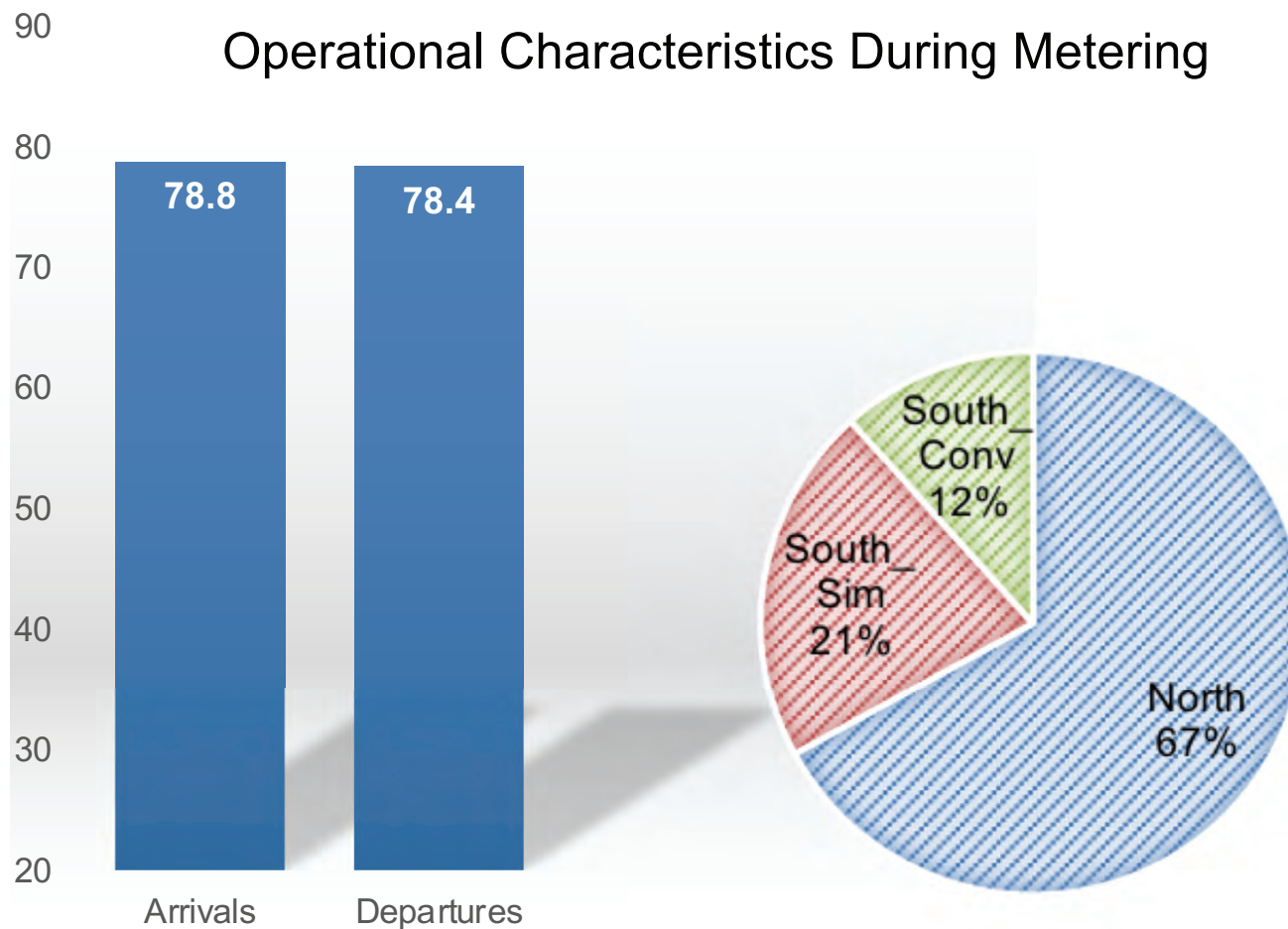


2) Surface metering hold levels are determined and implemented using IADS tools

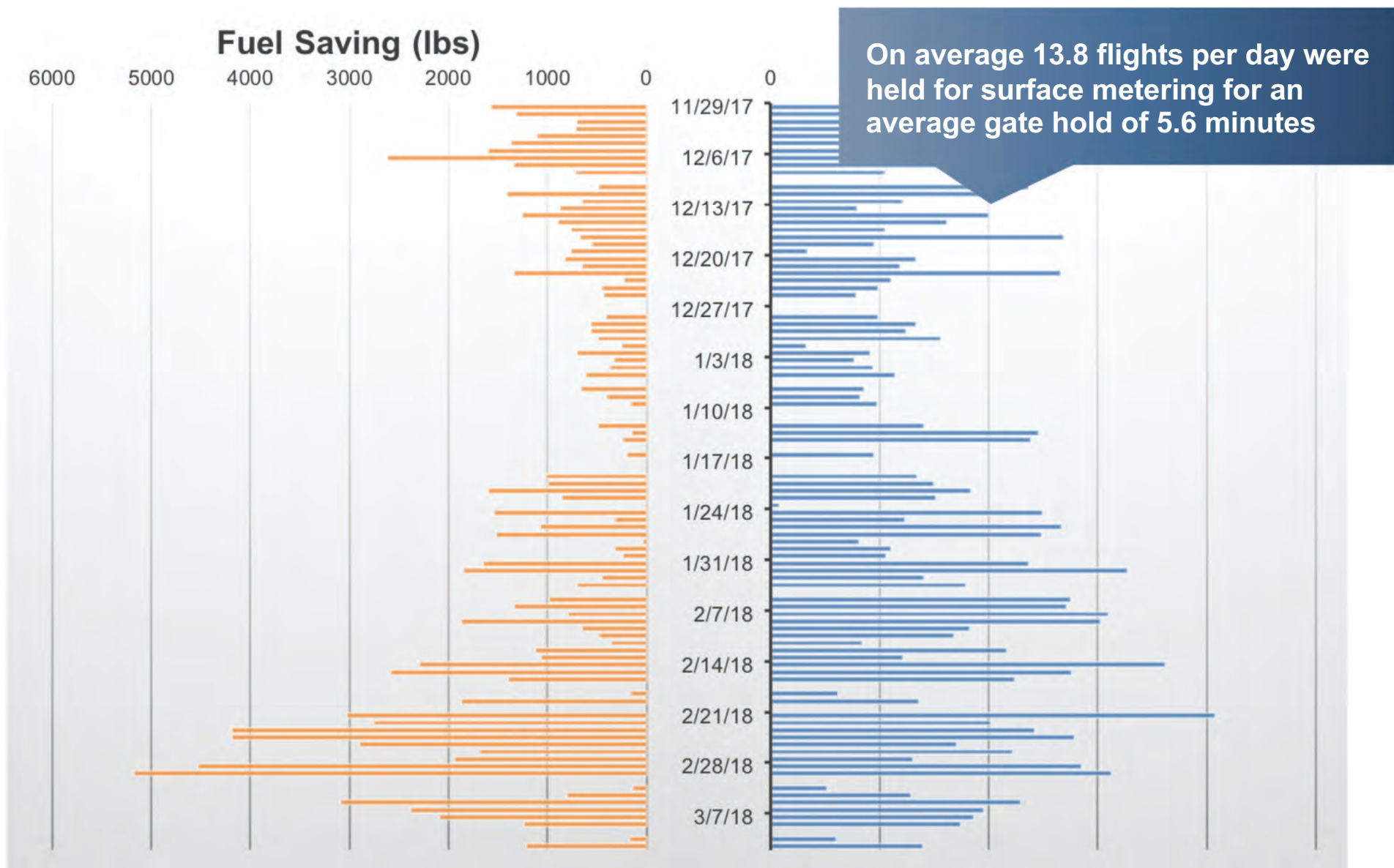
3) Ramp issues metering advisories to the flight deck to shift delay from the runway queue back to the gate

Surface metering procedures were initiated on November 29, 2017

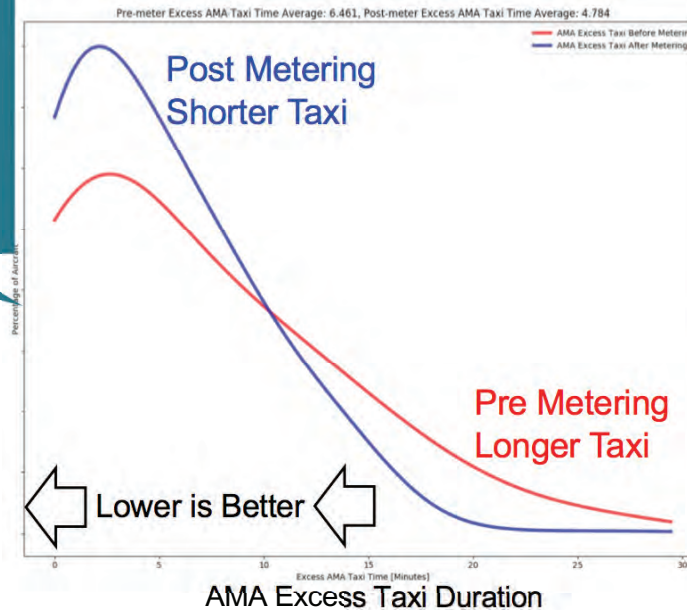
- Surface metering has been implemented 234 of 273 (85.7%) days



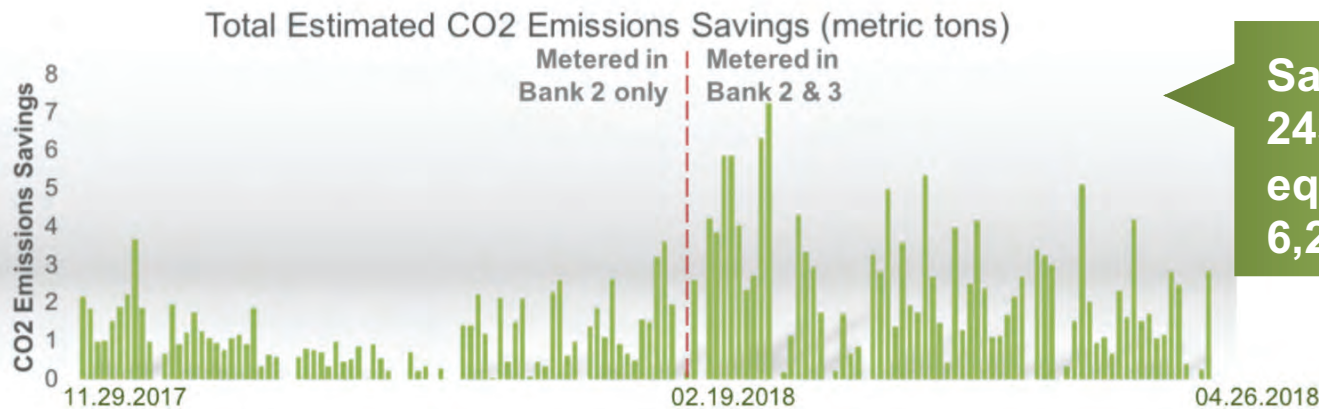
Collaborative Surface Metering: Gate Hold and Fuel Savings



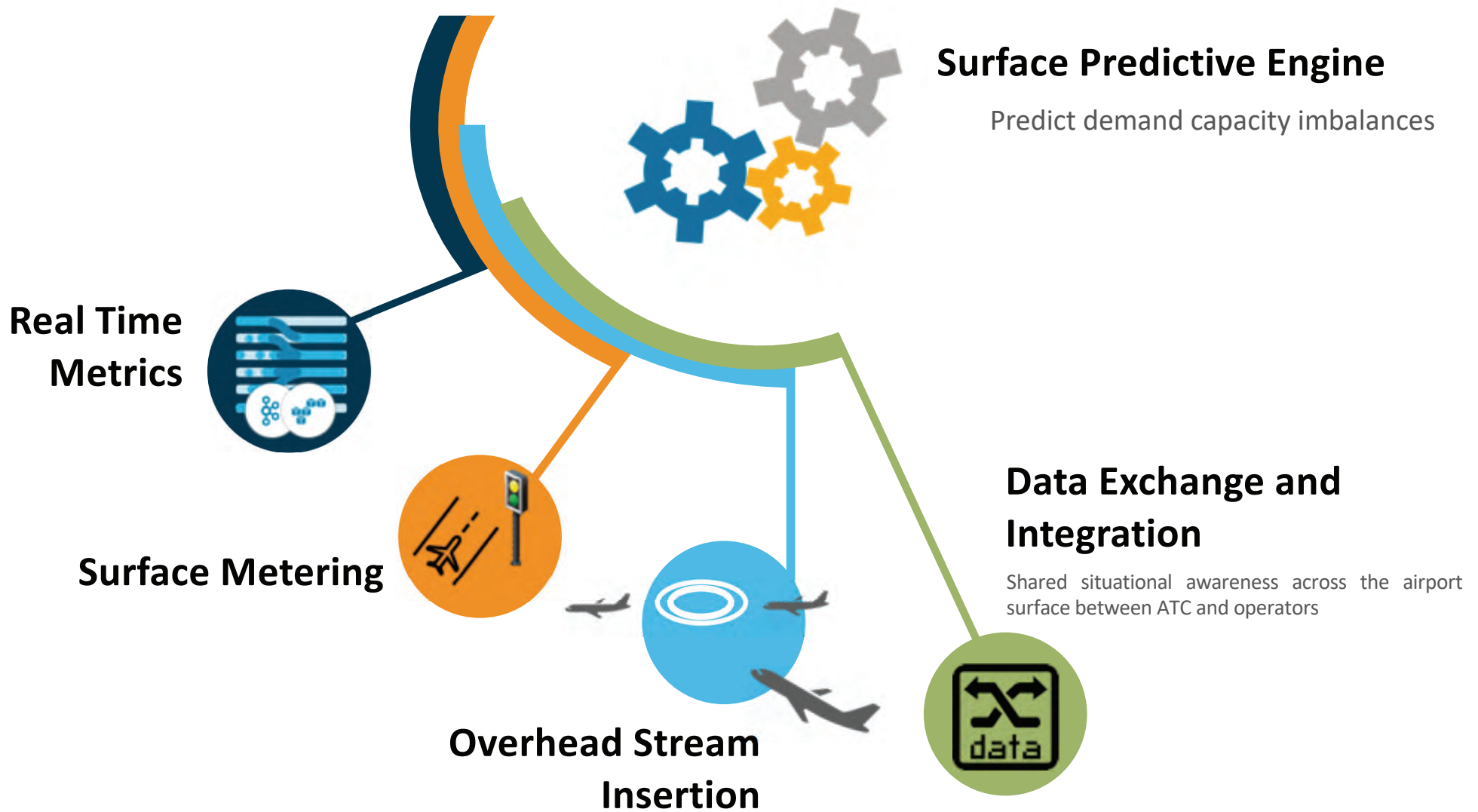
Reduced AMA taxi out times during its use via small holds at gate



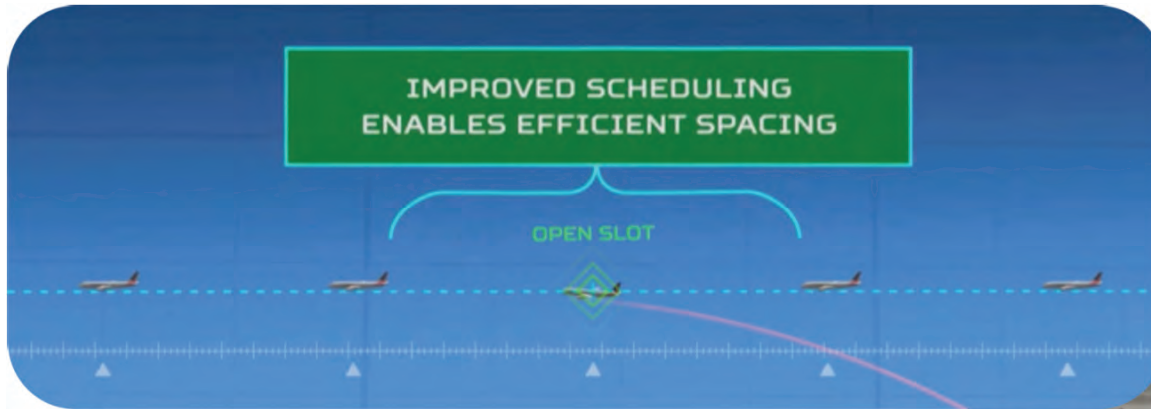
Saved approximately 173,801 lbs. of fuel by small holds at gate



Saved approximately 243 metric tons of CO₂, equivalent to planting 6,226 urban trees



Integrated Arrival, Departure, and Surface (IADS) Operations



PHASE
2

Phase 2 Development

Fused IADS Demonstration

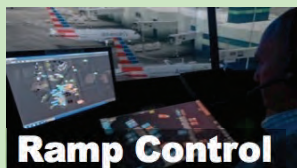
- Strategic planning tools
- Atlanta airspace tactical scheduling
- Integrating with FAA Tools
- Providing Data to External Operators and Industry
- Expanding to the GA community





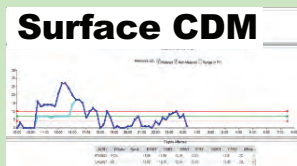
ATCT Control

- CLT ATCT control positions
- Baseline electronic flight data capability via TFDM EFD



Ramp Control

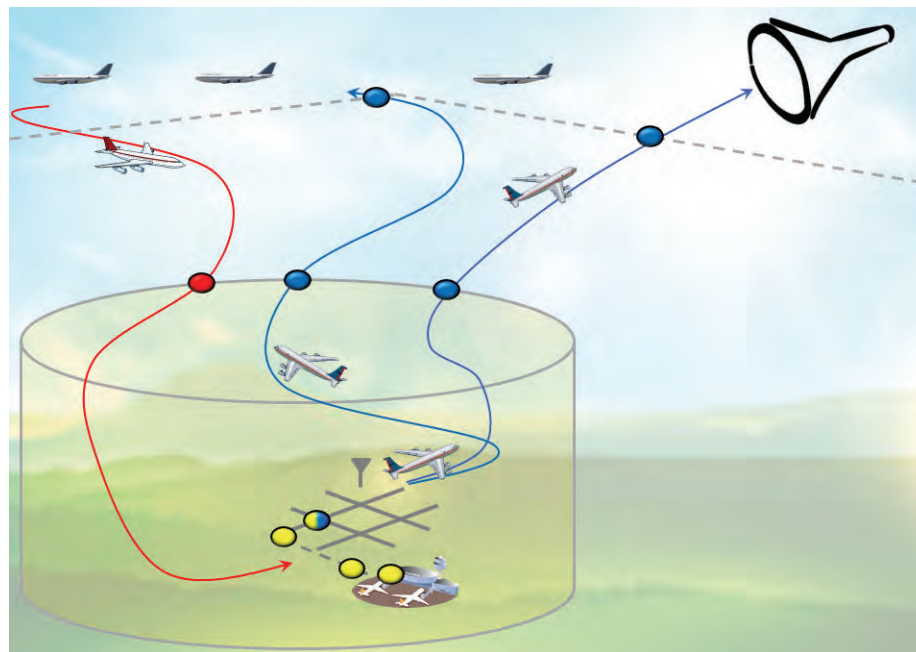
- AAL ramp controller and manager positions
- Tactical pushback advisories via RTC/RMTC display



Surface CDM

- All positions as needed
- Predictive mode: strategic metering info for situational awareness and analysis

Surface Components



Phase 1 Demonstration Goals

- Evaluate the Baseline IADS capability
- Enhance American Airlines CLT “departure sequencing” procedure with ATD-2 surface tactical metering
- Demonstrate improved compliance for a significant percentage of tactical TMI
- Mature strategic Surface CDM capability via operational use, analysis, and feedback
- Reduce ATCT workload by replacing paper strips with EFD



ATCT TMU

- CLT ATCT TMU position
- Tactical departure scheduling capability via STBO display



ARTCC

- ZDC TMU
- Tactical departure scheduling via modified TBFM/IDAC

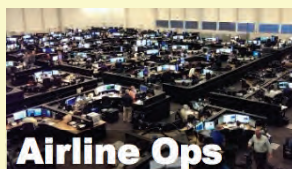


TRACON

- CLT TRACON TMU

Airspace Components

Interfaces to external systems via SWIM plus ATD-2 SWIM extensions



Airline Ops

★ = IADS user interface

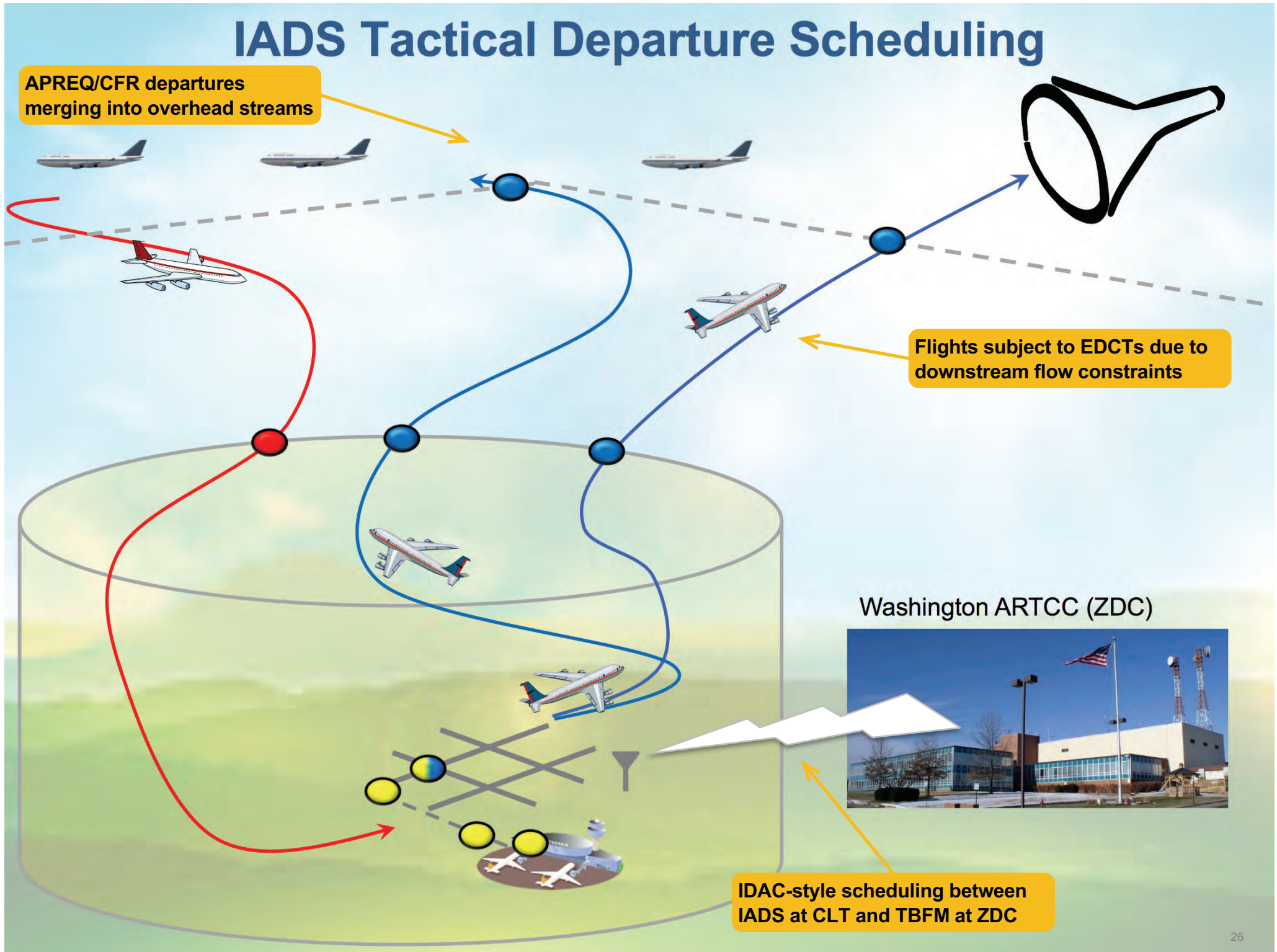
IADS Tactical Departure Scheduling

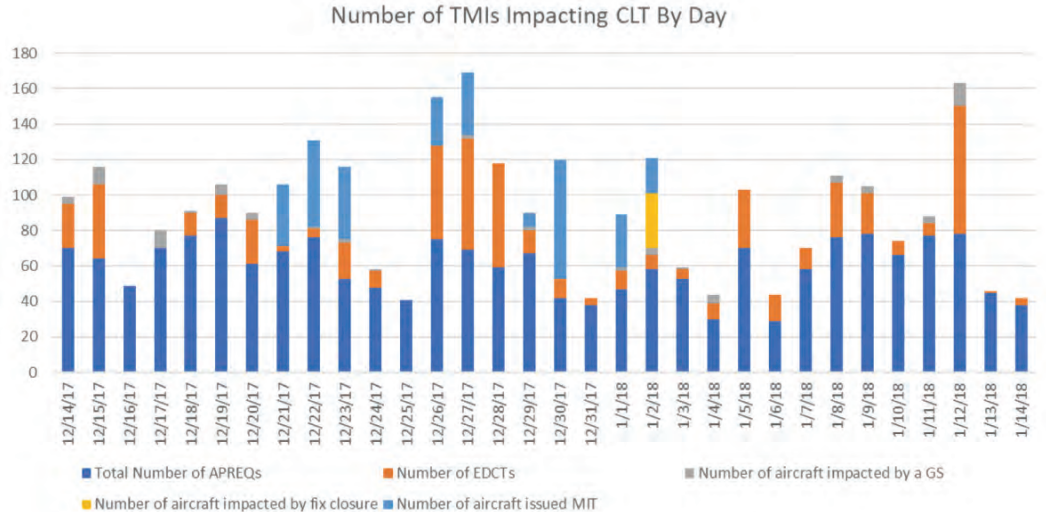
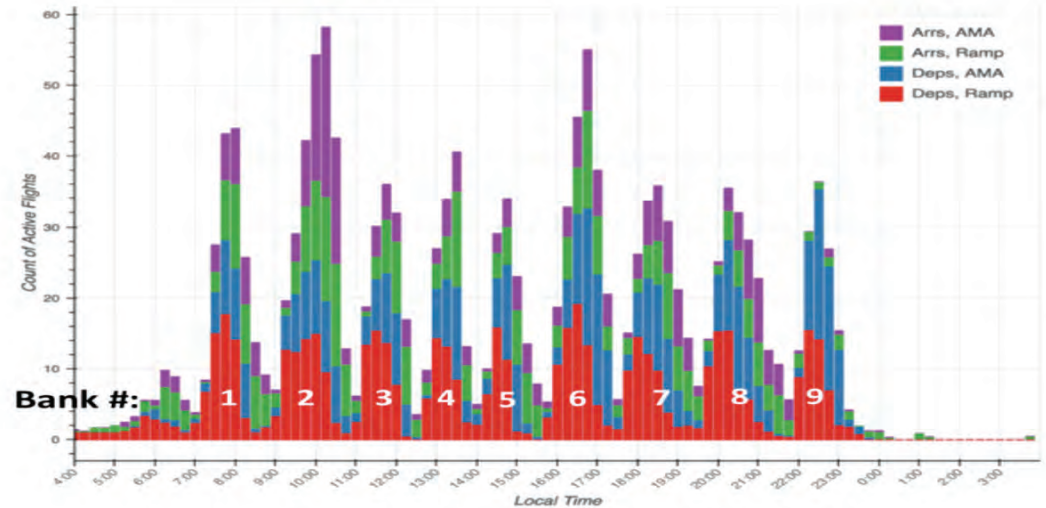
APREQ/CFR departures
merging into overhead streams

Flights subject to EDCTs due to
downstream flow constraints

Washington ARTCC (ZDC)

IDAC-style scheduling between
IADS at CLT and TBFM at ZDC

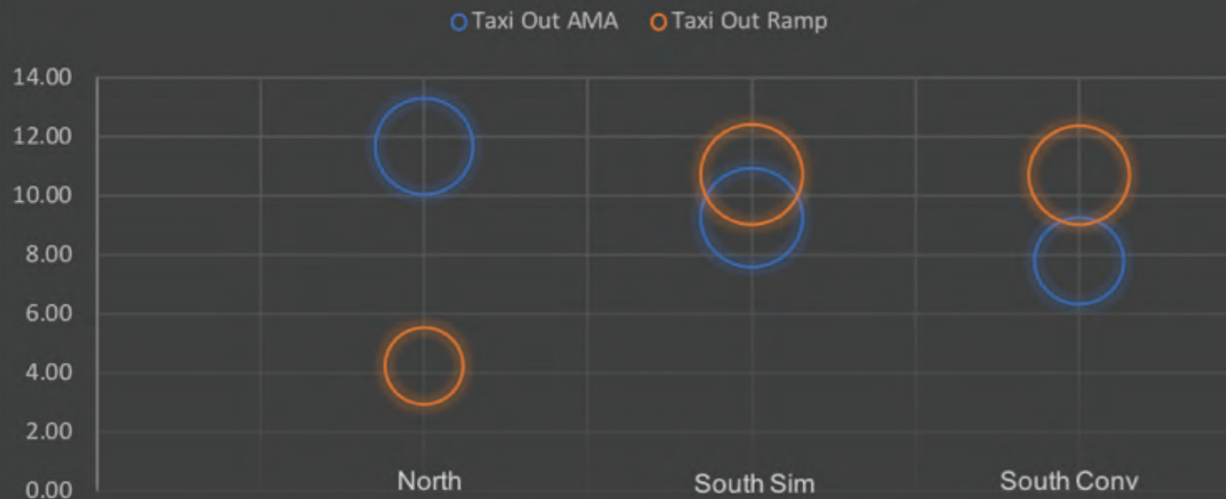




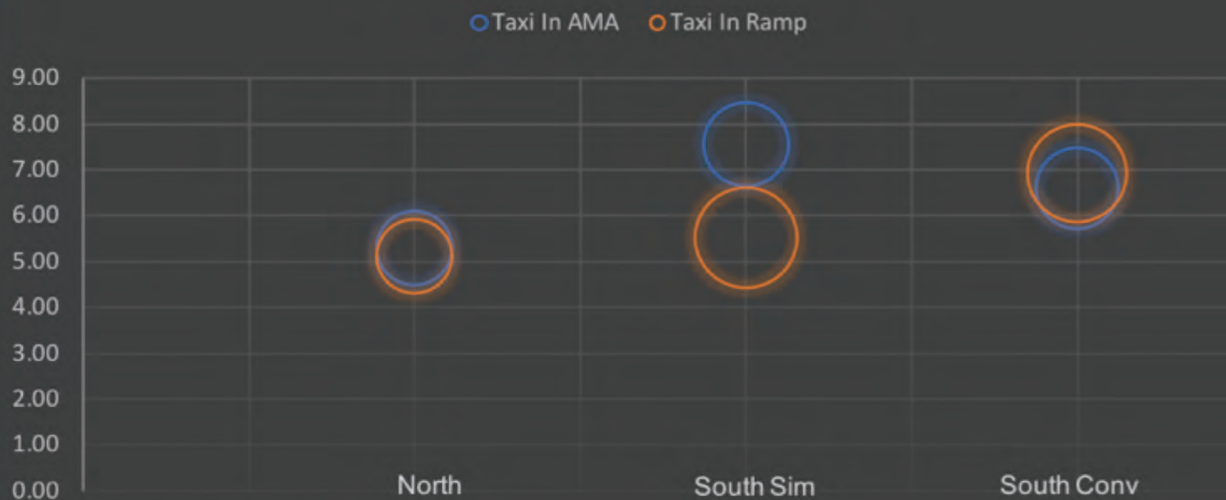
CLT is the seventh busiest airport in the world by total aircraft movements (545,742 takeoffs and landings in 2016)

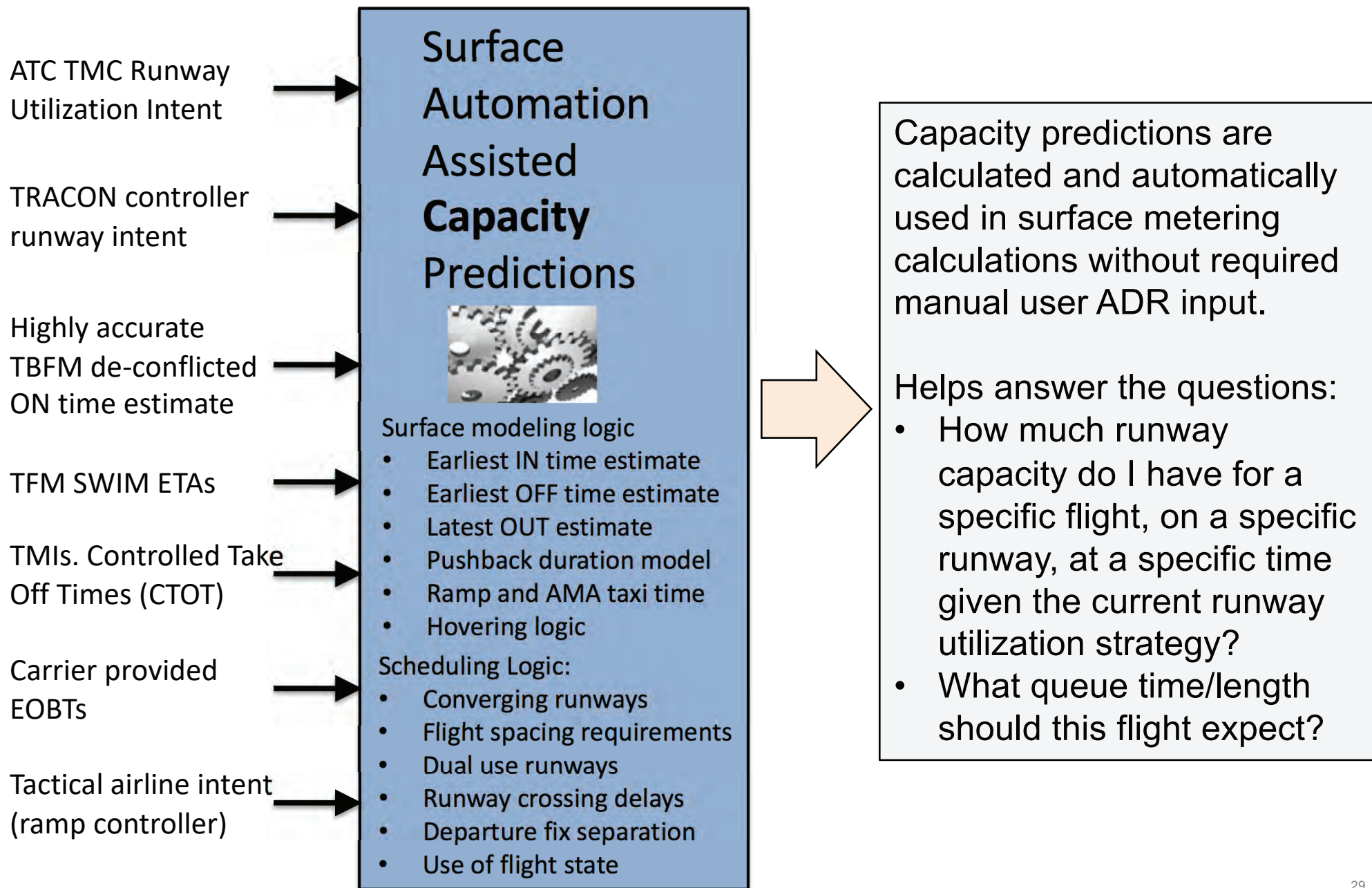


Taxi Out Time in the AMA and Ramp

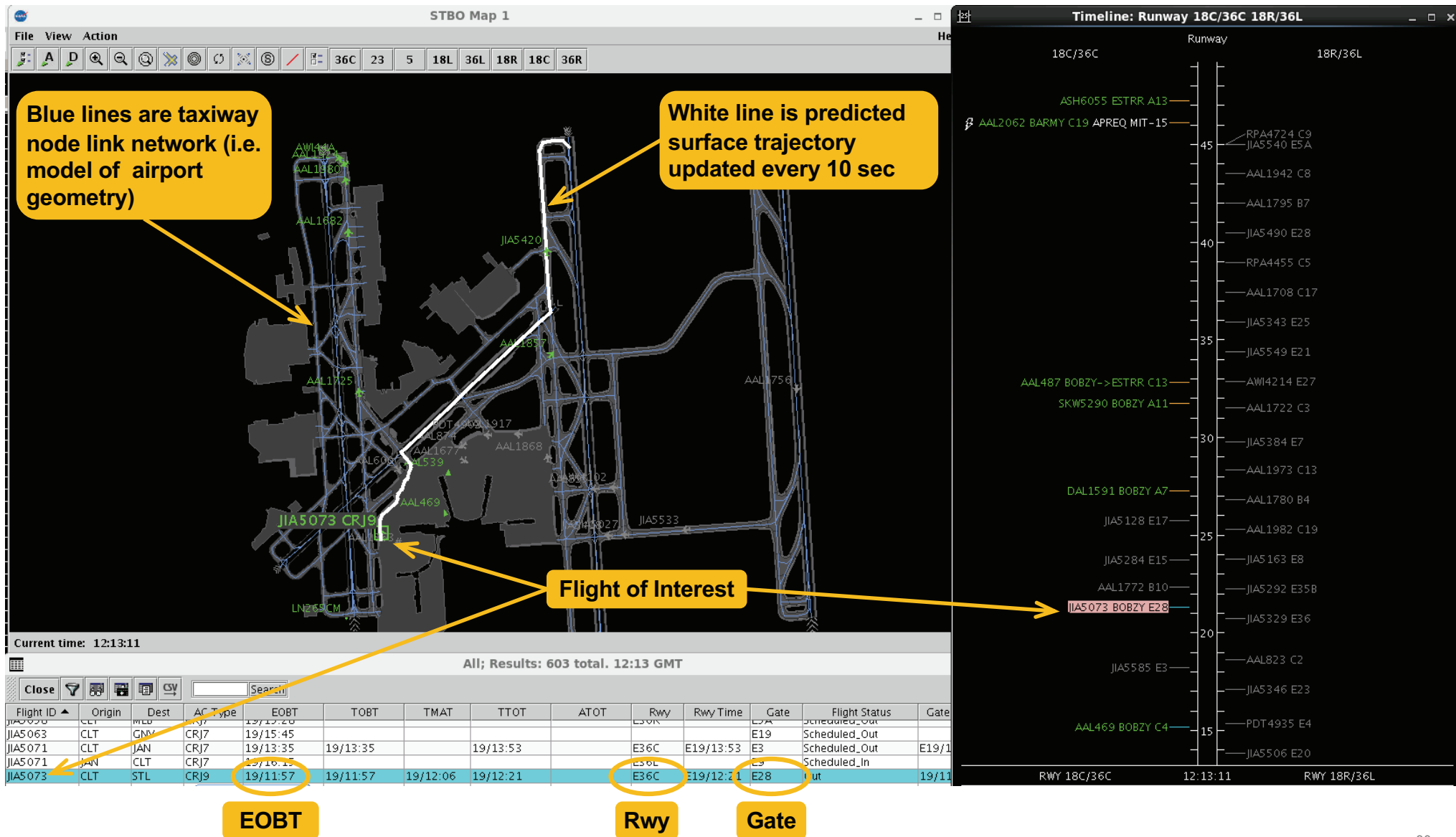


Taxi In Time in the AMA and Ramp

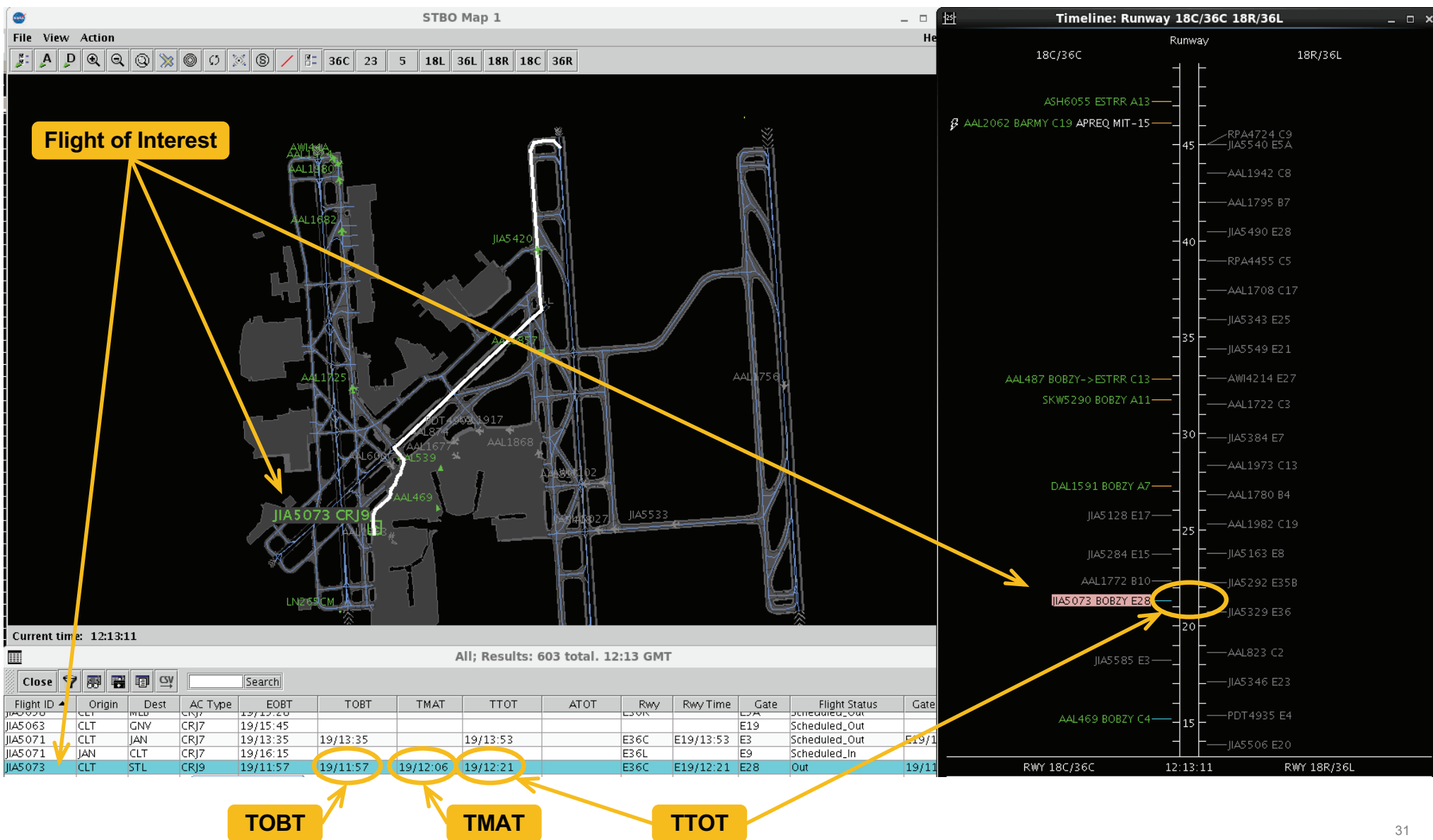




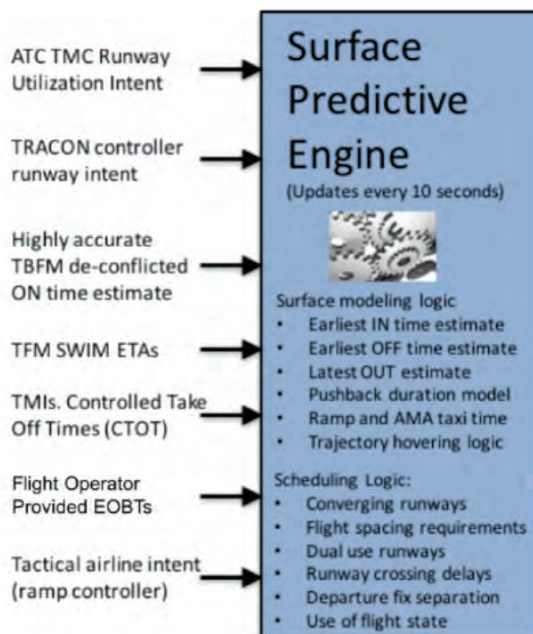
The IADS surface modeler combines airport geometry with flight-specific intent and status information to produce continuously-updated 3D (x,y,t) surface trajectories for each flight.



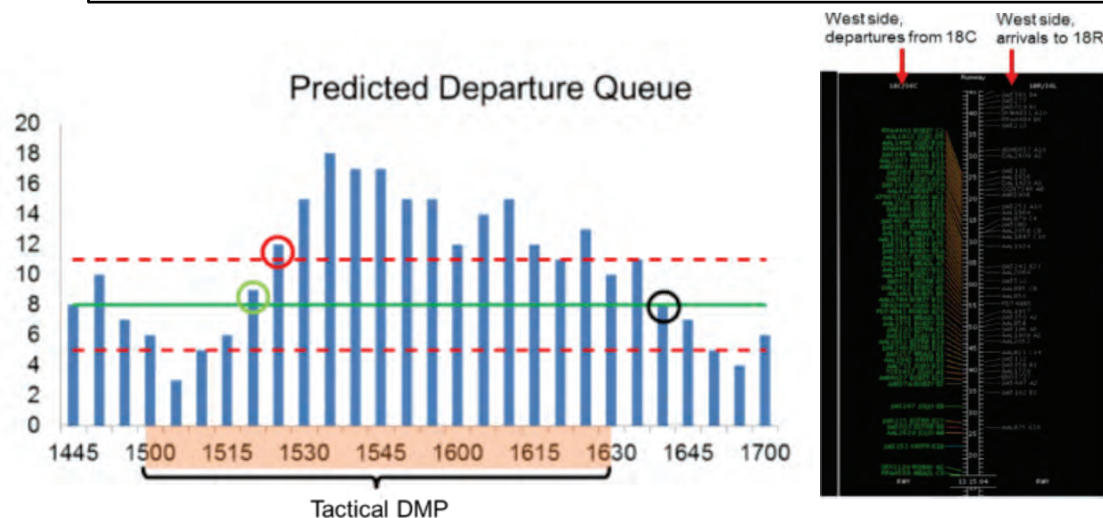
The IADS surface scheduler uses surface modeler inputs to produce target times for takeoff (TTOT), movement area entry (TMAT), and off block (TOBT)



1 Generate Demand and Capacity Predictions



2 Monitor Surface Demand Capacity Imbalances



“What If” available. If Surface Metering, Go to Step 3

3 Enable Metering. Set Hold Level

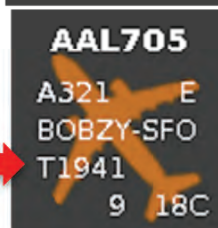


4 Honor TOBT and TMAAT advisories

TOBT Advisory



TMAAT Advisory



5 Evaluate Metering Effectiveness

